

FOR TEACHERS ONLY

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

PS–P

PHYSICAL SETTING/PHYSICS

Wednesday, January 28, 2004 — 9:15 a.m. to 12:15 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 3 before rating student papers.

Part A and Part B–1
Allow 1 credit for each correct response

Part A						Part B–1	
1	1	13	4	25	1	36	3
2	4	14	1	26	2	37	2
3	1	15	4	27	4	38	3
4	1	16	4	28	3	39	4
5	4	17	2	29	1	40	4
6	3	18	3	30	1	41	2
7	1	19	4	31	3	42	4
8	2	20	2	32	2	43	1
9	4	21	3	33	3	44	2
10	1	22	1	34	2	45	2
11	3	23	3	35	3	46	3
12	2	24	3			47	2
						48	3

Directions to the Teacher

Follow the procedures below for scoring student answer papers for the Physical Setting/Physics examination. Additional information about scoring is provided in the publication *Information for Administering and Scoring Regents Examinations in the Sciences*.

Use only red ink to rate Part A and Part B–1. For these two parts, indicate by means of a checkmark each incorrect or omitted answer. In the box provided on the back of the scannable answer sheet, record the number of questions the student answered correctly for those parts.

At least two science teachers must participate in the scoring of each student's responses to the Part B–2 and Part C open-ended questions. Each of these teachers should be responsible for scoring a selected number of the open-ended questions on each answer paper. No one teacher is to score all the open-ended questions on a student's answer paper.

Students' responses must be scored strictly according to the Scoring Key and Rating Guide. For open-ended questions, credit may be allowed for responses other than those given in the rating guide if the response is a scientifically accurate answer to the question and demonstrates adequate knowledge as indicated by the examples in the rating guide.

Fractional credit is *not* allowed. Only whole-number credit may be given to a response. Units need not be given when the wording of the questions allows such omissions.

When scoring Part B–2 and Part C, the raters must record with a Number 2 pencil the score earned by the student on each question in Part B–2 and Part C *on the back of that student's machine-scannable answer sheet*. Raters should enter the scores earned for Part A, Part B–1, Part B–2, and Part C on the appropriate lines in the box printed on the scannable answer sheet and then should add these four scores and enter the total in the box labeled "Total Written Test Score." Then, the student's raw scores on the written test should be converted to a scaled score by using the conversion chart for this administration of the examination. The student's scaled score should be entered in the labeled box on the student's scannable answer sheet. The scaled score is the student's final examination score.

All student answer papers that receive a scaled score of 60 through 64 **must** be scored a second time. For the second scoring, a different committee of teachers may score the student's paper or the original committee may score the paper, except that no teacher may score the same open-ended questions that he/she scored in the first rating of the paper. The school principal is responsible for assuring that the student's final examination score is based on a fair, accurate, and reliable scoring of the student's answer paper.

Because scaled scores corresponding to raw scores in the conversion chart may change from one examination to another, it is crucial that for each administration, the conversion chart provided for that administration be used to determine the student's final score.

Please refer to the Department publication *Regents Examination in Physical Setting/Physics: Rating Guide for Parts B–2 and C*. This publication can be found on the NYS Education Department web site at <http://www.emsc.nysed.gov/osa/scire/phyratg02.pdf>. Teachers should become familiar with this guide before rating students' papers.

Scoring Criteria for Calculations

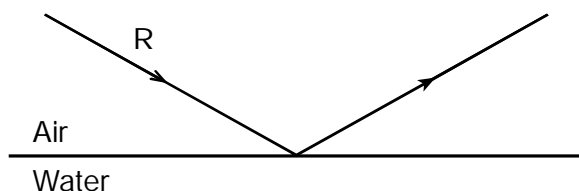
For each question requiring the student to show *all calculations, including the equation and substitution with units*, apply the following scoring criteria:

- Allow 1 credit for the equation and substitution of values with units. If the equation and/or substitution with units is not shown, do *not* allow this credit.
- Allow 1 credit for the correct answer (number and unit). If the number is given without the unit, do *not* allow this credit.
- Penalize a student only once per equation for omitting units.
- Allow full credit even if the answer is not expressed with the correct number of significant figures.

Part B–2

- 49 Allow 1 credit for **1.0** m or **1** m.
- 50 Allow 1 credit for **0.50** s or **0.5** s.
- 51 Allow 1 credit for **6.0** m/s or **6** m/s.
- 52 Allow 1 credit for indicating that the angle of incidence is **61°** ($\pm 2^\circ$).
- 53 Allow 1 credit for drawing the reflected ray with $\theta_r = 61^\circ$ ($\pm 2^\circ$). Allow credit for a response that is consistent with the student's answer to question 52.

Example of an Acceptable Response



- 54** Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this scoring key.

Example of an Acceptable Response

$$a = \frac{F_{net}}{m}$$

$$a = \frac{5.0 \text{ N}}{0.50 \text{ kg}}$$

$$a = 10. \text{ m/s}^2 \text{ or } 10. \text{ N/kg}$$

- 55** Allow 1 credit for **5.0 N** or **–5.0 N**.

Note: If the student indicates that the ball is kicked vertically, an answer of 10.0 N is acceptable. If the student indicates that the ball is kicked at an angle, an answer between 5.0 N and 10.0 N is acceptable.

- 56** Allow a maximum of 2 credits, 1 credit for **magnitude** or **size** and 1 credit for **direction**.

- 57** Allow 1 credit for stating that the magnitudes of the two forces are equal. Acceptable responses include, but are not limited to:

- The force of the engines is equal in magnitude to the frictional drag force.
- They are equal.
- $F_f = F_{\text{engine}}$

- 58** Allow 1 credit for **2**.

- 59** Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this scoring key.

Example of an Acceptable Response

$$V = \frac{W}{q}$$

$$V = \frac{8.35 \times 10^{-14} \text{ J}}{1.60 \times 10^{-19} \text{ C}}$$

$$V = 5.22 \times 10^5 \text{ J/C or } 5.22 \times 10^5 \text{ V}$$

- 60** Allow 1 credit for **25.0** (± 1.7) Ω .
- 61** Allow 1 credit for indicating that the neutron is more massive.
- 62** Allow 1 credit for indicating that the charge on the electron antineutrino is zero *or* neutral.

Part C

- 63** Allow 1 credit for indicating that the sphere is attracted to both rods.
- 64** Allow 1 credit for indicating that the sphere is repelled by the positive rod (only).
- 65** Allow 1 credit for **7.15** m/s².
- 66** Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this scoring key.

Examples of Acceptable Responses

$$F t = \Delta p$$

$$F = \frac{m\Delta v}{t}$$

$$F = \frac{(1,250 \text{ kg})(26.8 \text{ m/s})}{3.75 \text{ s}}$$

$$F = 8,930 \text{ N}$$

or

$$F = ma$$

$$F = (1,250 \text{ kg})(7.15 \text{ m/s}^2)$$

$$F = 8,940 \text{ N}$$

Allow credit for an answer that is consistent with the student's response to question 65.

- 67** Allow 1 credit for **12,300** N.
- 68** Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this scoring key.

Example of an Acceptable Response

$$F_f = \mu F_N$$

$$F_f = (.80)(12,300 \text{ N})$$

$$F_f = 9,800 \text{ N} \text{ or } 9.8 \times 10^3 \text{ N}$$

Allow credit for an answer that is consistent with the student's response to question 67.

- 69** Allow 1 credit for using computed values to explain whether or not the manufacturer’s claim is possible. Acceptable responses include, but are not limited to:

- Yes. It is reasonable, because the available friction force is greater than the needed acceleration force.
- Yes. The friction force is greater.
- Yes. The accelerating force is less.

Allow credit for an answer that is consistent with the student’s responses to questions 66 and 68.

Note: Do not allow this credit for a “yes” or “no” response without an appropriate explanation.

- 70** Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this scoring key.

Example of an Acceptable Response

$$E = \frac{hc}{\lambda}$$

$$E = \frac{(6.63 \times 10^{-34} \text{ J}\cdot\text{s})(3.00 \times 10^8 \text{ m/s})}{6.58 \times 10^{-7} \text{ m}}$$

$$E = 3.02 \times 10^{-19} \text{ J}$$

- 71** Allow 1 credit for **1.89 eV**.

Allow credit for an answer that is consistent with the student’s response to question 70.

- 72** Allow 1 credit for indicating that the n_3 to n_2 transition is also **1.89 eV**.

Allow credit for an answer that is consistent with the student’s response to question 71.

Note: Do not allow credit for a “yes” or “no” response without an appropriate explanation.

73 Allow a maximum of 4 credits for describing an experiment that could be used to measure the acceleration due to gravity on the Moon. The response must include:

- the equipment needed [1]
- what quantities would be measured using the equipment [1]
- what procedure the students should follow [1]
- what equations and/or calculations the students would need to do to arrive at a value for the acceleration due to gravity on the Moon [1]

Acceptable responses include, but are not limited to:

freefall

- object, meterstick, stopwatch
- time of fall, distance of fall
- drop object from measured height, time its fall
- $d = v_i t + \frac{1}{2} at^2$

pendulum

- string, mass, stopwatch, meterstick
- length of pendulum, period
- measure length of pendulum, period of pendulum
- $T = 2\pi \sqrt{\frac{\ell}{g}}$

spring scale

- spring scale, known mass
- weight on Moon of known mass
- hang the weight on the spring scale and weigh it
- $F_{g_M} = mg_M$ or $\frac{F_{g_M}}{F_{g_E}} = \frac{g_M}{g_E}$

74 Allow a maximum of 2 credits, 1 credit for correct frequency and 1 credit for sufficient energy (amplitude or loudness or duration).

75 Allow 1 credit for indicating that the frequency of the sound is changed by variations in the speed of the tape.

Regents Examination in Physical Setting/Physics

January 2004

**Chart for Converting Total Test Raw Scores to
Final Examination Scores (Scaled Scores)**

The *Chart for Determining the Final Examination Score for the January 2004 Regents Examination in Physical Setting/Physics*, normally located on this page, was unavailable at the time of printing. This chart will be posted on the Department's web site: <http://www.emsc.nysed.gov/osa> by 10:00 a.m. on Wednesday, January 28, 2004. Conversion charts provided for previous administrations of the Physical Setting/Physics examination must NOT be used to determine students' final scores for this administration of the examination.

Map to Core Curriculum

January 2004 Physical Setting/ Physics			
Question Numbers			
Key Ideas	Part A	Part B	Part C
Standard 1			
Math Key Idea 1	3, 9, 12, 16, 17, 18, 19, 21, 23, 24, 25, 26, 33, 35	36, 37, 39, 46, 54, 58, 59	65, 66, 68, 70, 71
Math Key Idea 2			
Math Key Idea 3		40, 60	
Sci. Inq Key Idea 1			
Sci. Inq Key Idea 2			73
Sci. Inq Key Idea 3			
Eng. Des. Key Idea 1			
Standard 2			
Key Idea 1			
Key Idea 2			
Standard 6			
Key Idea 1			
Key Idea 2			63, 64, 72
Key Idea 3			
Key Idea 4		57	
Key Idea 5			69
Key Idea 6			
Standard 7			
Key Idea 1			
Key Idea 2			
Standard 4 Process Skills			
4.1		44, 45, 46, 60	
4.3		41, 49, 50, 51, 52, 53	74, 75
5.1		38, 39, 57	
5.3		47, 48, 61, 62	72
Standard 4			
4.1	14, 15, 16, 17, 18, 19, 20, 21, 23, 24	40, 44, 45, 46, 58, 59, 60	
4.3	22, 25, 26, 27, 28, 29, 30, 32	41, 42, 43, 49, 50, 51, 52, 53	74, 75
5.1	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13	36, 37, 38, 39, 54, 55, 56	63, 64, 65, 66, 67, 68, 69, 73
5.3	31, 33, 34, 35	47, 48, 61, 62	70, 71, 72